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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,502	03/08/2004	Benjamin Szu-Min Lin	NAUP0548USA	2501

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NAIPO (NORTH AMERICA INTERNATIONAL PATENT OFFICE)  
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MERRIFIELD, VA 22116

EXAMINER

GURLEY, LYNNE ANN

ART UNIT PAPER NUMBER

2812

DATE MAILED: 08/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/708,502

**Applicant(s)**

LIN ET AL.

**Examiner**

Lynne A. Gurley

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

  
**LYNNE A. GURLEY**  
**PRIMARY PATENT EXAMINER**

**TC 2800, AU 2812**

## **DETAILED ACTION**

### ***Specification***

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Objections***

2. Claims 28-39 are objected to because of the following informalities:

In claim 28, lines 3-4, "aan insulatinglayer" should be "and an insulating layer".

In claim 28, lines 11-12 "ccoating fillingup" should be "coating filling up".

In claim 32, last line, "dualdamascene" should be "dual damascene".

In claim 39, lines 1-2, "organic materials comprises dyes" should be "organic materials comprise dyes". Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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4. Claims 1, 3, 6, 15, 17, 20, 28, 30, 33, and 36-38 are rejected under 35

U.S.C. 102(b) as being anticipated by Nagahara (US 2002/0192945, dated 12/19/02).

Nagahara shows the method as claimed, in figures 1-17 and corresponding text, with wiring 8 on a substrate ([0079], 8 is representative of underlying gate electrodes, etc.

Note that it is considered inherent that the cross section shown is only a portion of the

substrate in which more interconnects will be formed to underlying devices, so that

multiple conductive regions are inherent); insulating layers 7-4; hard mask 3; recess 9

(fig. 1B; does not expose 8); light blocking layer 2; gap filling layer 1 and photoresist

layer 1; photomask (fig. 2B); pattern above the recess (figs. 2C-3A) ([0079]-

[0088];[0115]). The recess is eventually extended to expose the conductive layer (Fig.

3B) and, a metal is placed in the recess (fig. 3C). In various embodiments, other

materials are used to fill the recess and to pattern the dual damascene interconnect.

5. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by

Harada et al. (US 6,251,774, dated 6/26/01).

6. Harada shows the method as claimed in figures 1-4 and corresponding text, with

emphasis on figures 1, with conductive layer 30, insulating layer 32-36, hard mask 38/40,

light blocking layer and gap filling layers 48/50, photoresist layer 52.

7. Claims 1 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Ma

(US 2003/0216036, dated 11/20/03, filed 6/5/03).

Ma shows the method as claimed in figure 2 and corresponding text, with

insulating substrate 200, conductive region 202, insulating layer 208, hard mask 210,

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light blocking layer 222 (TiN or TaN), gap filling layer 216 and resist layer 216; patterned resist 218 (fig. 2D), forming pattern 220 above the recess (fig. 2F) and exposing the conductive layer (fig. 2I).

8. Claims 1 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Chang (US 2003/0166345, dated 9/4/03, filed 3/2/02).

Chang shows the method as claimed in figures 2-4 and corresponding text, with insulating substrate 22A, conductive region 22B, insulating layer 26, hard mask 24B with DARC [0022], light blocking layer 32, gap filling layer 34 and resist layer 34; patterned resist 28C (fig. 2E), forming pattern 36B above the recess (fig. 2F) and exposing the conductive layer (fig. 2B). See [0022] –[0027].

### *Claim Rejections - 35 USC § 103*

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 2, 4-5, 7-14, 16, 18-19, 21-27, 29, 31-32, 34-35 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahara (US 2002/0192945, dated 12/19/02).

Nagahara shows the method substantially as claimed and, as described in the previous paragraphs.

Nagahara lacks anticipation only in not showing that 1) the substrate is SOI; 2) the recess exposes the conductive region; the steps after forming the pattern in the photoresist layer such as: forming a barrier layer on a surface of the light blocking layer and the dual damascene structure, a re-sputtering process to expose the conductive region; forming a seed layer on a surface of the barrier layer and the exposed conductive layer; and forming a metal layer on a surface of the seed layer, and the metal layer filling up the dual damascene structure; 3) the conductive region is an alignment mark and the recess is formed aside the conductive region; 4) the hard mask is TiN, 250 Angstroms thick; 5) the light blocking layer is TiN or TaN, 250 Angstroms thick; 5) the gap filling layer is BARC formed by spin coating; 6) the organic materials comprise dyes.

It would have been obvious to one of ordinary skill in the art to have had the substrate be an SOI substrate, in the method of Nagahara, with the motivation that depending upon the devices on the substrate, the SOI substrate would be advantageous, such as in a TFT device.

It would have been obvious to one of ordinary skill in the art to have had the recess expose the conductive region, in the method of Nagahara, with the motivation that

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the filler layers would have protected the substrate during the trench etch to a degree, even if the etch stop layer 7 were removed over the conductive layer and additionally, conventional fabrication shows the removal step at various stages including as one of the first steps. See Chang (US 2003/0166345; fig. 2B) with a similar process.

It would have been obvious to one of ordinary skill in the art to have included, in the method of Nagahara, the steps after forming the pattern in the photoresist layer such as: forming a barrier layer on a surface of the light blocking layer and the dual damascene structure, a re-sputtering process to expose the conductive region; forming a seed layer on a surface of the barrier layer and the exposed conductive layer; and forming a metal layer on a surface of the seed layer, and the metal layer filling up the dual damascene structure; the conductive region is an alignment mark and the recess is formed aside the conductive region, with the motivation that these steps would serve to protect the substrate during processing and the barrier and seed layers are conventional diffusion protection (see Okada et al. (US 6,514,860 for barrier layer 20). Structures of this type have served as alignment marks and borderless contacts.

It would have been obvious to one of ordinary skill in the art to have had the hard mask be TiN, and 250 Angstroms thick and to have had the light blocking layer be TiN or TaN, and Angstroms thick and to have had the gap filling layer be BARC formed by spin coating and to have had the organic materials comprise dyes, in the method of Nagahara, with the motivation that TiN and TaN are conventionally alternative materials for hard masks. The thicknesses are conventional, since there is now showing of criticality. Dyes will alter the light reflecting capabilities of the organic material to design specifications.

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In part, the gap filling is BARC and Nagahara shows that the gap filling, in another embodiment is all BARC by spin-coating.

*Conclusion*

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See the PTO Form 892 for additional pertinent art showing forms of the process.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 571-272-1670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 571-272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Lynne A. Gurley  
Primary Patent Examiner  
TC 2800, Art Unit 2812

LAG  
August 23, 2004